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ORIGINAL ARTICLE

Effect of Adding Dexamethasone or Magnesium Sulphate as an Adjuvant to Bupivacaine in Ultrasound Guided Supraclavicular Brachial Plexus Block for Upper Limb Surgeries; A Comparative Study

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ABSTRACT

Background: Supraclavicular brachial plexus block is a popular and widely employed regional nerve block technique for perioperative anesthesia and analgesia for surgery of the upper extremity. Coadminstration of local anaesthetics and several adjuvants is now a good way to hasten the onset of the block and to increase its duration. The aim of the current study was to evaluate the effects of dexamethasone and magnesium sulfate as additives to bupivacaine in supraclavicular brachial plexus block.

Patients and Methods: A Prospective randomized controlled comparative clinical study was conducted on 36 healthy patients of ASA grade I, II of age group 21-60 years scheduled for upper limb surgeries under supraclavicular brachial plexus block. Patients were allocated to three groups of 12 each as a control group (C) received 20 ml 0.5% bupivacaine, group (D) received 18 ml bupivacaine 0.5% + 2 ml (8mg) dexamethasone, group (M) received 18 ml bupivacaine 0.5% + 2 ml (200 mg) magnesium sulfate. Parameters observed were onset and duration of sensory and motor blocks and Timing and total amount of rescue analgesia. hemodynamics and complications were also recorded.

Results: D group significantly shorter regard onset of sensory and motor blocks followed by M group then Control Group. Also, D group significantly longer regard duration of sensory and motor blocks and time of first analgesia followed by M group then Control Group. Total rescue analgesia and Number of Rescue Analgesia were significantly lower in group D followed by M group then Control Group.

Conclusion: Addition of Dexamethasone or Magnesium sulphate to Bupivacaine 0.5 % for supraclavicular brachial plexus block fastened the onset of sensory and motor blocks and prolonged the duration of sensory and motor blocks, with Dexamethasone showed better results.

Keywords: ultrasound, brachial plexus, bupivacaine, dexamethasone, magnesium sulphate.

INTRODUCTION

Supraclavicular brachial plexus block is a popular and widely employed regional nerve block technique for perioperative anesthesia and analgesia for surgery of the upper extremity. Its supremacy over general anesthesia for upper extremity comes from its ability to achieve good sympathetic block, better analgesia postoperatively, marvelous success rate and minimal side effects [1] . brachial plexus can be targeted at many levels along its course but, still targeting it over the first rib and lateral to the subclavian artery which is known as the supraclavicular

approach is the most preferred technique being of the highest success rate and that's why it is known as the spinal block of the upper limb. Application of local anaesthetics in combination with several adjuvants is now a good way to fasten the onset of the block and to increase its time and potency. Adjuncts usage aims at prolonging the analgesia, achievement of good block without causing systemic side effects and also, reducing the total dosage of local anesthetic. Adjuncts like opioids, clonidine, neostigmine, bicarbonate, magnesium sulphate and dexamethasone have been tried [2] .Dexamethasone exerts its action through blocking the nociceptive impulse travel along the unmyelinated C fibers in addition to its anti-inflammatory features [3] . Magnesium sulphate, being a physiological antagonist to calcium, has the ability to produce anti-nociceptive effect and voltage dependent regulation of calcium influx into the cell in addition to non-competitive antagonism of N-methyl-D-aspartate (NMDA) receptors [4] . The aim of the current study was to evaluate the effects of using dexamethasone or magnesium sulfate in combination with bupivacaine in supraclavicular brachial plexus block.

PATIENTS AND METHODS

After obtaining approval from the scientific committee of anesthesia and surgical intensive care department and the institutional review board (IRB) of faculty of medicine Zagazig University. Written informed consent was obtained from all participants. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

This Prospective comparative randomized clinical study was carried out in Zagazig university hospitals from March 2019 to August 2019.

Assuming that the mean ± standard deviation of sensory block onset in the control group (Bupivacaine + 0.9% normal saline) is 12.85 ± 2.6 minutes, and in combination group (Bupivacaine + dexamethasone) 10.3 ± 2.4 minutes [5] . So, the total sample size is 36 patients (12 in each of the 3 groups) using open Epi info with power of test 80% and confidence interval 95%.

36 Patients were divided randomly by a computer-generated randomization table into three groups; 12 patients each:

- Group C (Control group) (n=12): patients received 28 ml of bupivacaine 0.5% + 2 ml of normal saline.
- Group D (Dexamethasone group) (n=20): patients received 28 ml of bupivacaine 0.5% + 8 mg of Dexamethasone (2 ml).
- Group M (Magnesium Sulphate group) (n=12): patients received 28 ml of bupivacaine 0.5% + 200 mg of Magnesium Sulphate (2 ml).

Inclusion criteria:

American Society of Anesthesiologists (ASA) physical status classification class I or II, age group 21-60 years of both sexes, patients undergoing elective upper limb surgery below the level of shoulder.

Exclusion criteria

Patient refusal (consent not given), ASA physical status classification class III or more, Any bleeding disorder and patient on anticoagulants, severe respiratory disease, Neurological deficit involving brachial plexus, Local infection at the injection site, History of allergy to local anesthetic.

All patients had been kept fasting for minimum of 6 hours before the operation. All patients had been clinically examined in the preoperative period and routine investigations had been checked and at the same time, whole procedure had been explained. Ten centimeters visual analog scale (VAS) (0 – no pain and 10 – worst pain imaginable) had been also explained during preoperative visit. Visual Analog Scale assessment had been done ½ hourly for first 2 hours, then hourly for next 6 hours, then every 4 hours for 24 hours. When patient complained of pain equivalent to **VAS score ≥ 4**, rescue analgesia was given in the form of fentanyl 25μg intravenous increments, as needed. The total amount of fentanyl given to each patient during first 24 hours of the postoperative period has been recorded.

Ultrasound-guided single-injection supraclavicular block has been performed using a 6-13 MHz linear US probe (Sonosite

M-Turbo) placed in a sterile sheath and using the in-plane technique. While the patient is supine with the head is tilted to the opposite side of the block and after identifying the brachial plexus trunks and/or divisions over the first rib, lateral to the subclavian artery, skin infiltration with 1 mL of lidocaine 1% is done then a sterile 22-gauge blunt Stimuplex needle 50 mm was advanced to the junction of the first rib and subclavian artery. After negative aspiration, the perineural solution has been injected in 5-mL aliquots ensuring spread in the corner pocket plexus sheath under vision with the screen.

Statistical analysis

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represent as number and percentage , quantitative continues group represent by mean ± SD , the following tests were used to test differences for significance;. difference and association of qualitative variable by Chi square test (X2) . Differences between quantitative independent multiple by ANOVA . P value was set at <0.05 for significant results & <0.001 for high significant result.

Data were collected and submitted to statistical analysis. The following statistical tests and parameters were used: Mean, Standard deviation (SD), The chi square test and the t statistic to test whether the means are different.

RESULTS

1- Demographic data:

There was no statistically significant difference (P > 0.05) between the three groups as regards age, weight, height, body mass index (BMI), duration of surgery, gender and ASA physical status (Table 1).

2- Onset and duration of sensory and motor block and analgesic characters:

D group significantly shorter (P < 0.05) regard onset of sensory and motor blocks followed by M group then Control Group. Also, D group significantly longer (P < 0.05) regard duration of sensory and motor blocks and time of first analgesia followed by M group then Control Group. Total rescue analgesia and Number of Rescue Analgesia were significantly lower (P < 0.05) in group D followed by M group then Control Group (Table 2).

3- Pain assessment using visual analogue scale (VAS):

VAS was matched until 7th hour as it started to raise especially in control group which was significantly higher (P < 0.05) than other groups followed by M group Lastly D group and at 20 and 24 hours control group and M group were matched and significantly higher (P < 0.05) than D group (Table 3) & (Figure 1).

4- hemodynamic variables:

- As regards heart rate, there was no statistically significant difference between the three groups (P > 0.05) (Figure 1).
- As regards mean arterial pressure (MAP), there was no statistically significant difference between the three groups (P > 0.05) (Figure 3).
- As regards peripheral oxygen saturation (SPO2), there was no statistically significant difference between the three groups (P > 0.05) (Figure 4).

5- Complications:

As regards the complications (e.g., pneumothorax, Horner's syndrome or local anesthetics systemic toxicity), none of the patients in both groups had experienced any side effect or complication either of the anesthetic technique or of the used drugs.

Table 1: Basic demographic and clinical characters of studied groups

	Control Group (N=12)	Group D (N=12)	Group M (N=12)	F	P
Age (years)	**37.66±8.3**	**35.25±10.13**	**36.0±8.9**	**0.218**	**0.805**
Weight (kg)	**71.91±5.6**	**71.75±5.8**	**71.83±4.8**	**0.003**	**0.997**
Height (cm)	**170.83±3.4**	**170.4±3.6**	**171.16±2.3**	**0.163**	**0.850**

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			Control Group (N=12)	Group D (N=12)	Group M (N=12)	F	P
BMI (kg/m²)			24.61±1.2	24.67±1.4	24.51±1.4	0.042	0.959
Duration surgery (min)			71.25±14.9	68.33±13.7	67.91±11.76	0.216	0.807
Gender	F	N	4	4	4	0.0	1.0
		%	33.3%	33.3%	33.3%		
	M	N	8	8	8		
		%	66.7%	66.7%	66.7%		
ASA	I	N	9	9	9	0.0	1.0
		%	75.0%	75.0%	75.0%		
	II	N	3	3	3		
		%	25.0%	25.0%	25.0%		
Total		N	12	12	12		
		%	100.0%	100.0%	100.0%		

There was no statistically significant difference (P > 0.05) between the three groups as regards age, weight, height, body mass index (BMI), duration of surgery, gender and ASA physical status.
*ASA : American Society of Anesthesiologists
*group D : Dexamethasone group
*group M : Magnesium Sulphate group
Data were expressed as mean ± Standard deviation (SD) and range
With F-test and P-value statistically used

Table 2: Onset and duration of sensory and motor block and analgesic characters

			Control Group (N=12)	Group D (N=12)	Group M (N=12)	F	P
Onset of sensory block (min)			16.76±1.16	13.08±1.2	14.99±0.98	22.263	0.00**
Onset of motor block (min)			20.96±1.15	15.41±1.67	18.98±0.86	38.804	0.00**
Duration sensory block (hours)			8.54±0.96	17.33±1.3	14.83±2.12	103.440	0.00**
Duration motor block (hours)			6.83±1.0	14.58±1.56	10.66±1.37	101.216	0.00**
Timing of analgesia (hours)			8.54±0.96	17.33±1.3	14.83±2.12	103.440	0.00**
Total rescue analgesia (µg)			93.75±15.5	29.16±9.51	60.41±16.7	61.008	0.00**
Number of rescue analgesia	1	N	0	10	0	46.8	0.00**
		%	0.0%	83.3%	0.0%		
	2	N	0	2	8		
		%	0.0%	16.7%	66.7%		
	3	N	4	0	3		
		%	33.3%	0.0%	25.0%		
	4	N	7	0	1		
		%	58.3%	0.0%	8.3%		
	5	N	1	0	0		
		%	8.3%	0.0%	0.0%		
Total		N	12	12	12		
		%	100.0%	100.0%	100.0%		

D group significantly shorter (P < 0.05) regard onset of sensory and motor blocks followed by M group then Control Group. Also, D group significantly longer (P < 0.05) regard duration of sensory and motor blocks and time of first analgesia followed by M group then Control Group. Total rescue analgesia and Number of Rescue Analgesia were significantly lower (P < 0.05) in group D followed by M group then Control Group.

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Table 3: Visual Analogue Scale (VAS) distribution at different times post operatively among groups

	Control Group (N=12)	Group D (N=12)	Group M (N=12)	F	P
VAS1st_half_hr	0.00±0.0	0.00±0.0	0.00±0.0	.	.
VAS2nd_half_hr	0.00±0.0	0.00±0.0	0.00±0.0	.	.
VAS3rd_half_hr	0.00±0.0	0.00±0.0	0.00±0.0	.	.
VAS4th_half_hr	0.00±0.0	0.00±0.0	0.00±0.0	.	.
VAS3rd_hr	0.00±0.0	0.00±0.0	0.00±0.0	.	.
VAS4th_hr	0.00±0.0	0.00±0.0	0.00±0.0	.	.
VAS5th_hr	0.00±0.0	0.00±0.0	0.00±0.0	.	.
VAS6th_hr	0.1±0.03	0.00±0.0	0.00±0.0	1.000	0.379
VAS7th_hr	2.08±0.28	0.00±0.0	1.25±0.39	137.500	0.00**
VAS8th_hr	3.08±0.28	0.00±0.0	2.25±0.45	318.132	0.00**
VAS12th_hr	4.08±0.28	0.1±0.04	3.35±0.45	477.714	0.00**
VAS16th_hr	3.86±0.49	2.2±0.5	3.08±0.79	8.896	0.001**
VAS20th_hr	4.0±0.0	2.0±0.0	3.69±0.49	154.000	0.00**
VAS24th_hr	4.0±0.0	3.16±0.38	4.0±0.0	55.000	0.00**

*VAS : Visual Analogue Scale

VAS was matched until 7th hour as it started to raise especially in control group which was significantly higher ($P < 0.05$) than other groups followed by M group Lastly D group and at 20 and 24 hours control group and M group were matched and significantly higher ($P < 0.05$) than D group.

Figure 1 : Pain assessment using visual analogue scale (VAS):

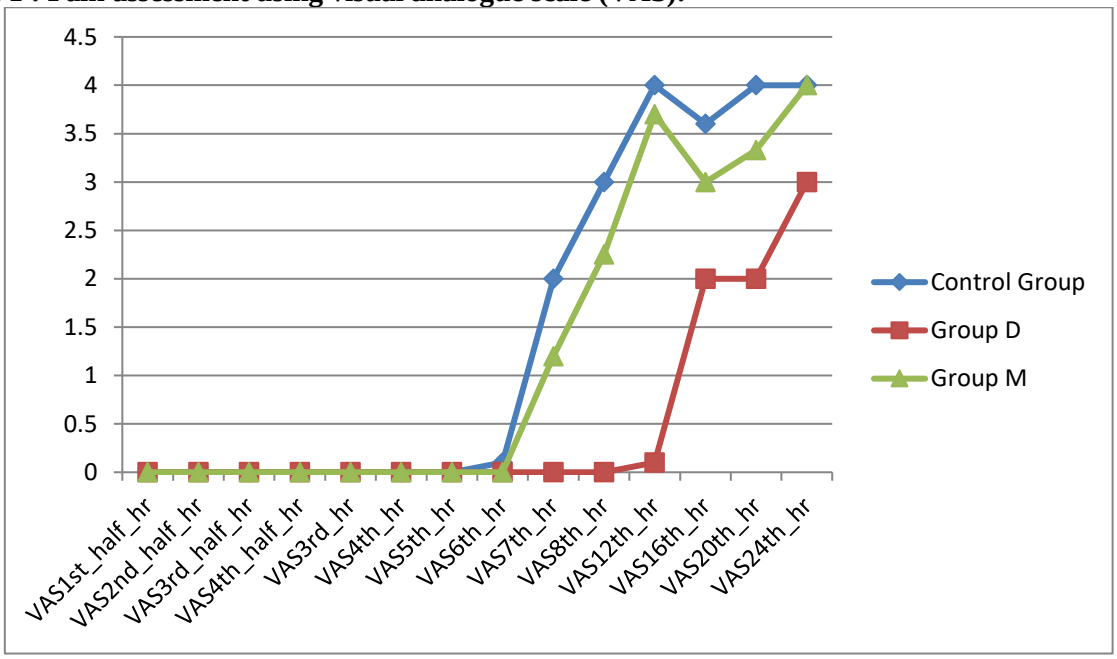

Figure 2 VAS among groups **VAS: Visual Analogue Scale*

VAS was matched until 7th hour as it started to raise especially in control group which was significantly higher ($P < 0.05$) than other groups followed by M group Lastly D group and at 20 and 24 hours control group and M group were matched and significantly higher ($P < 0.05$) than D group.

Figure 2 : heart rate distribution among groups

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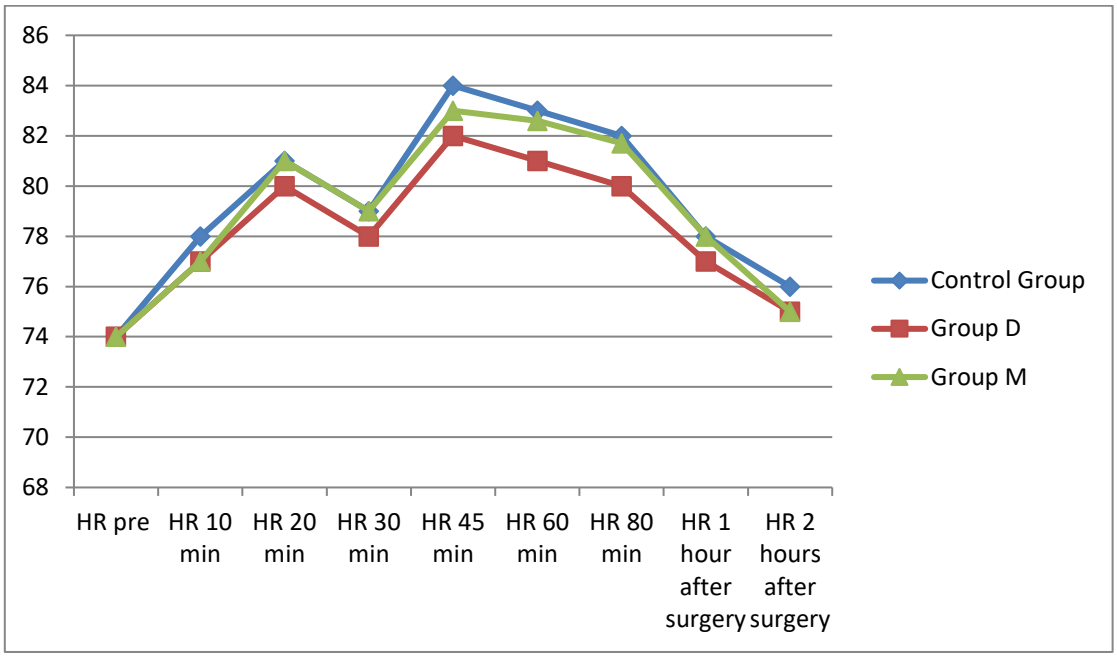

*Figure 3 Heart Rate distribution among groups *HR: Heart Rate*

As regards heart rate, there was no statistically significant difference between the three groups (P > 0.05) .

Figure 4: mean arterial pressure (MAP) distribution among studied groups

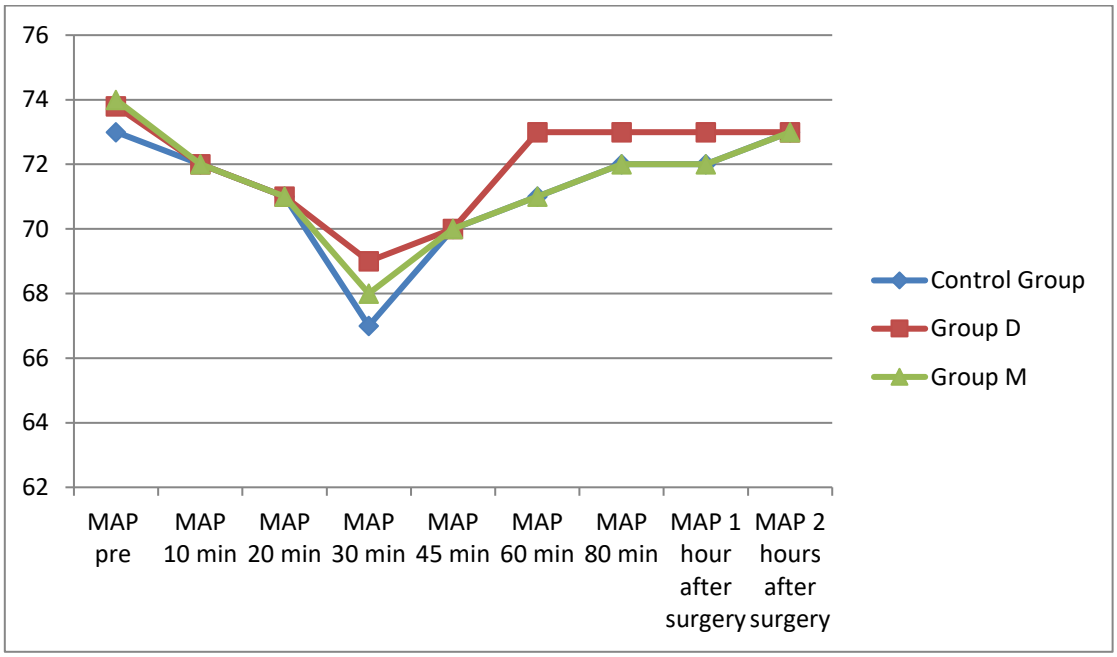

*Figure 3 MAP among groups *MAP: Mean Arterial Pressure*

As regards mean arterial pressure (MAP), there was no statistically significant difference between the three groups (P > 0.05) .

Figure 4: peripheral oxygen saturation (SPO2) among groups

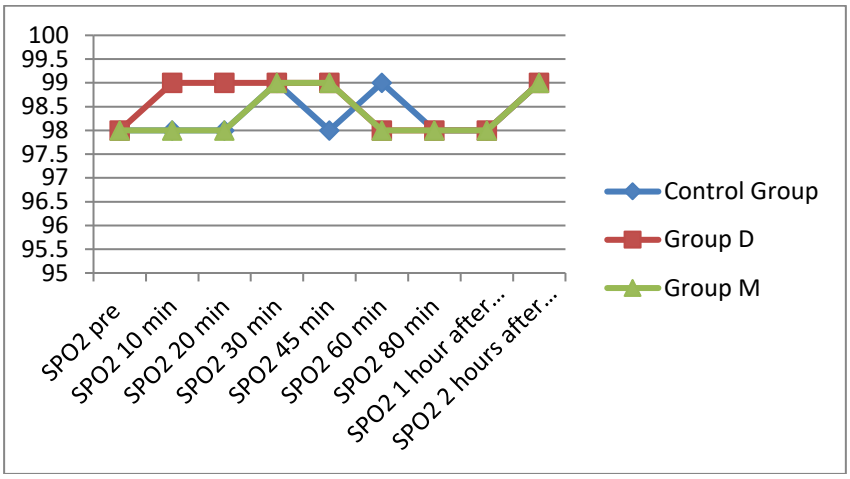

*Figure 5 SPO2 among groups *SPO2: Peripheral Oxygen Saturation*

As regards peripheral oxygen saturation (SPO2), there was no statistically significant difference between the three groups (P > 0.05).

DISCUSSION

The major findings of this study indicated that the onset of sensory and motor blocks was significantly faster in Group D followed by Group M then Group C. Duration of sensory and motor blocks showed significant increase in Group D followed by Group M then Group C. Total postoperative analgesic consumption was significantly less in group D followed by Group M then Group C.

Concerning the demographic data there was no statistically significant variation between the study groups. As regards the duration of surgery, the time recorded for each patient showed statistically non-significant differences between the study groups.

Many studies done previously had proved the advantage of using dexamethasone and magnesium sulfate as additive to local anesthetic in nerve block, with less studies done to compare these two.

Regarding the onset of sensory and motor blocks, our study showed that both dexamethasone and magnesium sulphate shortened the onset of sensory and motor blockade, with dexamethasone showed better results.

Our results are in accordance with work of ***Azzazi and his colleagues*** [6] **,** ***Li, et al*** [7] ***and Hamed and his colleagues*** [8] . Study done by ***Hamed and his colleagues*** to evaluate the effect of using magnesium sulphate or dexamethasone in combination with bupivacaine in patients scheduled for elective surgeries on the upper limb through brachial plexus block under ultrasound guidance. patients were randomly allocated into three groups; group one (n=30) received 20 ml 0.5% plain bupivacaine, group two (n=30) received 18 ml bupivacaine 0.5% + 2 ml (8mg) dexamethasone, group three (n=30) received 18 ml bupivacaine 0.5% + 200 mg magnesium sulfate. The onset of sensory blockade in minutes was earlier in group 2 (dexamethasone) as compared to group 1 and 3; 8.20±2.09 versus 16±3.48 (P< 0.05) and 8.20±2.09 versus 12.70 ± 2.92(P< 0.05) respectively, also the sensory block onset was earlier in group 3 (magnesium) than group 1 (control) 12.70 ± 2.92 versus 16±3.48. Also onset of motor block in minutes was earlier in group 2 than in group 1 and 3; 1.50 ± 2.09 versus 13.10 ± 3.34 and 12.75 ± 3.43 respectively, while the difference in motor block onset was clinically insignificant between group 1 and 3.

In contrast to our study, study done by ***Fahmy and his colleagues*** [9] concluded that neither dexamethasone nor magnesium sulphate had significantly affected the onset time of sensory and motor blocks. Their study included 63 patients scheduled for arthroscopic rotator cuff repair through interscalene brachial plexus block under ultrasound guidance. The block was achieved using 0.5% bupivacaine 20 ml plus either 5 ml of 10% MgSO4 (group M) or 5 ml of normal saline containing dexamethasone 8 mg

(group D) or 5 ml of 0.9% NaCl (group C). The onset of sensory block was 13.5 ± 0.92 min in group C, 14.3 ± 1.4 min in group M, and 13.5 ± 1.1 min in group D. The onset of motor block was 15.7 ± 0.85 min in group C, 15.9 ± 0.88 min in group M, and 16 ± 0.74 min in group D.

Regarding the duration of sensory and motor blocks, our study showed that both dexamethasone and magnesium sulphate prolonged the duration of sensory and motor blockade, with supremacy of dexamethasone.

Our results are in accordance with work of ***Parveen and his colleagues*** [5] **,** ***Ghali and his colleague*** [10] ***and Raghavan and his colleagues*** [11] **.** study done by ***Raghavan and his colleagues*** comparing usage of magnesium sulphate against dexamethasone as additives to local anesthetics in supraclavicular brachial plexus block showed supremacy of dexamethasone. Ninety patients were divided into three equal groups; the control group (S) received 30 mL of local anesthetic solution and 2ml normal saline, dexamethasone group (SD) received the same local anesthetic solution with 8 mg Dexamethasone added to it and magnesium sulfate group (SM) received 30 ml local anesthetic solution with 150mg magnesium sulfate added to it and made it to the same volume as other groups. Duration of analgesia was found to be highest in dexamethasone Group (SD) followed by Group (SM) then group (S).

In contrast to our study, a previously mentioned study done by ***Fahmy and his colleagues*** [9] comparing the addition of magnesium sulphate against dexamethasone to bupivacaine in ultrasound-guided interscalene nerve block for shoulder arthroscopy showed no statistically significant difference in the duration of motor block between the three groups. It was 240.6 ± 18.8 min in group C, 244.1 ± 38.4 min in group M, and 247 ± 19.8 min in group D ($P > 0.05$). whereas, the analgesic duration was 254 ± 15.2 min in group C, 721.85 ± 98.6 min in group M, and 744.8 ± 20.8 min in group D, with a P-value of less than 0.05, thus implying that the analgesic duration was significantly longer in the magnesium and dexamethasone group than in the control group.

As regards postoperative analgesia and the total postoperative analgesic consumption, our study showed significant prolongation of the duration of postoperative analgesia with remarkably lower VAS scores through the study period in dexamethasone group followed by magnesium sulphate group then control group. also, Total amount of rescue analgesia in form of fentanyl was less in dexamethasone group followed by magnesium sulphate group then control group.

Our results are in accordance with work of ***Azzazi and his colleagues*** [6] **,** ***Ghali and his colleague*** [10] ***El-Baradey and Elshmaa*** [12] ***and Shaikh and his colleagues*** [13] **.** In ***Shaikh and his colleagues*** [13] Rescue analgesic chosen was diclofenac sodium injection. In the control group, 24 patients received 2 diclofenac sodium injections and 3 patients received 3 injections in the first 24 hours postoperative period. While in the study group, 25 patients received analgesia once and 2 patients received 2 injections

As regards hemodynamic data in our study, blood pressure, heart rate and peripheral oxygen saturation were recorded intraoperative and postoperative. There was no statistically significant difference in hemodynamics between the three groups.

Similarly ***Parveen and his colleagues*** [5] found no statistically significant difference between the study and control groups as regards the hemodynamic variables (HR and blood pressure) both intraoperative and postoperative.

Also, Previously mentioned study done by ***Azzazi and his colleagues*** [6] showed no statistically significant difference between the study and control groups as regards the hemodynamic variables (HR and blood pressure) both intraoperative and postoperative.

Concerning the complications in our study, none of the patients in study groups had experienced any side effect or complication either of the anesthetic technique or of the used drugs.

Also, Previously mentioned study done by ***Azzazi and his colleagues*** [6] showed no complications among study groups.

CONCLUSION

The addition of either magnesium sulfate or dexamethasone to bupivacaine 0.5% in ultrasound guided supraclavicular brachial plexus block for upper limb surgeries hastened the onset, prolonged the duration of sensory and motor blocks, increased post-operative analgesia and decreased rescue analgesia needed without increasing the risk of adverse effects, with Dexamethasone showed better results.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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REFERENCES

1. Kooloth RA, Patel SN, Mehta MK. A comparision of 0.5% Ropivacaine and 0.5% Bupivacaine in supraclavicular brachial plexus block. Natl J Med Res. 2015;5(1):67-70.
2. Dhumane P, Shakir N. Supraclavicular Brachial Plexus Block with and without Dexamethasone as an Adjuvant to local anaesthetics: a Comparative Study. International Journal of Biomedical and Advance Research. 2016;7(9):456-9.
3. Shrestha B, Maharjan S, Shrestha S, Gautam B, Thapa C, Thapa P, et al. Comparative study between tramadol and dexamethasone as an admixture to bupivacaine in supraclavicular brachial plexus block. JNMA J Nepal Med Assoc. 2007;46(168):158-64.
4. Kogler J. The analgesic effect of magnesium sulfate in patients undergoing thoracotomy. Acta Clin Croat. 2009;48(1):19-26.
5. Parveen S, Jan M, Taj A, Bhat AA. Effect of dexamethasone as an adjuvant with bupivacaine in ultrasound guided single shot supraclavicular brachial plexus block in upper extremity surgeries-a prospective randomized study. International Journal of Research in Medical Sciences. 2017;5(5):2139-43.
6. Azzazi E, Mohamed H, El Sayed El Agamy A, Mohamed MM, Al-Salam A, Nageeb MM. Effect of Adding Dexamethasone to Bupivacaine in Ultrasound Guided Supraclavicular Brachial Plexus Block Versus Bupivacaine alone for Upper Limb Orthopedic Surgery; A Comparative Study. Egyptian Journal of Hospital Medicine. 2018;71(7).
7. Li M, Jin S, Zhao X, Xu Z, Ni X, Zhang L, et al. Does Magnesium Sulfate as an Adjuvant of Local Anesthetics Facilitate Better Effect of Perineural Nerve Blocks? The Clinical journal of pain. 2016;32(12):1053-61.
8. Hamed R, Osman N, Hassan W, Omar S. Abstract PR295: Dexamethasone Versus Magnesium Sulfate As An Additives to Bupivacaine in Ultrasound Guided Supraclavicular Brachial Plexus Blockade. Anesthesia & Analgesia. 2016;123(3S_Suppl):383.
9. Fahmy NG, Ahmed DM, Sameer GM. A comparative study between the addition of MgSO 4 against dexamethasone to bupivacaine in the prolongation of ultrasound-guided interscalene nerve block for shoulder arthroscopy. Ain-Shams Journal of Anaesthesiology. 2015;8(3):402.
10. Ghali AM, Molokhia KMA, Ahmed SA. The Effect on Outcome of Adding Magnesium Sulphate to Bupivacaine in the Ultrasound-guided Supraclavicular Brachial Plexus Block Anesthesia. International Journal of Anesthesia and Clinical Medicine. 2019;7(1):13.
11. Raghavan RK, Ashraf S. The effects of magnesium sulfate and dexamethasone as additives to local anaestheticin supraclavicular block a randomised controlled study.J. Evid. Based Med. Healthc. 2017; 4(71), 42544257. DOI: 10.18410/jebmh/2017/846.
12. El-Baradey GF, Elshmaa NS. The efficacy of adding dexamethasone, midazolam, or epinephrine to 0.5% bupivacaine in supraclavicular brachial plexus block. Saudi journal of Anaesthesia. 2014;8(Suppl 1):S78.
13. Shaikh MR, Majumdar S, Das A, Saha TK, Bandyopadhyay SN, Mukherjee D. Role of dexamethasone in supraclavicular brachial plexus block. IOSR-JDMS. 2013;12:1-7.

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